

02150-43

证 明

CERTIFICATE

本证明之附件是向中国专利局作为受理局提交的下列国际申请副本
THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY OF THE BELOW
IDENTIFIED INTERNATIONAL APPLICATION THAT WAS FILED WITH THE
CHINESE PATENT OFFICE AS RECEIVING OFFICE

国际申请号: PCT/CN03/00048

INTERNATIONAL APPLICATION NUMBER

国际申请日: 20 JAN 2003 (20.01.2003)

INTERNATIONAL FILING DATE

发明名称: System and Method for Manufacture of a Hard Disc
Drive Arm and Bonding of Magnetic Head to
Suspension on a Drive Arm

TITLE OF INVENTION

申请人: SAE MAGNETICS(H.K.)LTD

APPLICANT

中华人民共和国国家知识产权局局长
COMMISSIONER OF THE STATE INTELLECTUAL PROPERTY
OFFICE OF THE PEOPLE'S REPUBLIC OF CHINA

王景川

二零零三年二月二十八日
FEBRUARY, 28. 2003

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.	PCT/CN 03/00048
International Filing Date	20 JAN 2003 (20.01.03)
Name of receiving Office and "PCT International Application"	RO/CN 中华人民共和国国家知识产权局
Applicant's or agent's file reference (if desired) (12 characters maximum)	FPEL02150043

Box No. I TITLE OF INVENTION	
System and Method for Manufacture of a Hard Disc Drive Arm and Bonding of Magnetic Head to Suspension on a Drive Arm	
Box No. II APPLICANT <input type="checkbox"/> This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	Telephone No.
SAE MAGNETICS (H. K.) LTD. SAE Tower, 38-42 Kwai Fung Crescent Kwai Chung N. T. Hong Kong Special Administrative Region, P. R. of China	Facsimile No.
	Teleprinter No.
	Applicant's registration No. with the Office
State (that is, country) of nationality: CN	State (that is, country) of residence: CN
This person is applicant for the purposes of: <input checked="" type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	This person is:
YAO, Minggao Winnerway Industrial Area, Nancheng, Dongguan City Guangdong Province, P. R. of China Zip Code: 511700	<input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input checked="" type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)
	Applicant's registration No. with the Office
State (that is, country) of nationality:	State (that is, country) of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	<input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	Telephone No.
CHINA PATENT AGENT (H.K.) LTD. 22/F, Great Eagle Centre 23 Harbour Road, Wanchai Hong Kong Special Administrative Region The People's Republic of China	(852)28284688
	Facsimile No.
	(852)28271018
	Teleprinter No.
	Agent's registration No. with the Office
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

Sheet No. 2

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

SHIRAISHI, Masashi
Flat C, 22/F, Tower 9
Laguna Verde (Phase IIA)
Hung Hom, Kowloon
Hong Kong Special Administrative Region
P. R. of China

This person is:

- ☐ applicant only
☐ applicant and inventor
☒ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

XIE, Yiru
Winnerway Industrial Area,
Nancheng, Dongguan City
Guangdong Province,
P. R. of China Zip Code: 511700

This person is:

- ☐ applicant only
☐ applicant and inventor
☒ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

Applicant's registration No. with the Office

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No. V DESIGNATION OF STATES Mark the applicable check-boxes below; at least one must be marked.

The following designations are hereby made under Rule 4.9(a):

Regional Patent

- ☐ **AP ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZM Zambia, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT (if other kind of protection or treatment desired, specify on dotted line)
- ☐ **EA Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☐ **EP European Patent:** AT Austria, BE Belgium, BG Bulgaria, CH & LI Switzerland and Liechtenstein, CY Cyprus, CZ Czech Republic, DE Germany, DK Denmark, EE Estonia, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, SK Slovakia, TR Turkey, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ **OA OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GQ Equatorial Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | | |
|--|---|---|
| <input type="checkbox"/> AE United Arab Emirates | <input type="checkbox"/> GM Gambia | <input type="checkbox"/> NZ New Zealand |
| <input type="checkbox"/> AG Antigua and Barbuda | <input type="checkbox"/> HR Croatia | <input type="checkbox"/> OM Oman |
| <input type="checkbox"/> AL Albania | <input type="checkbox"/> HU Hungary | <input type="checkbox"/> PH Philippines |
| <input type="checkbox"/> AM Armenia | <input type="checkbox"/> ID Indonesia | <input type="checkbox"/> PL Poland |
| <input type="checkbox"/> AT Austria | <input type="checkbox"/> IL Israel | <input type="checkbox"/> PT Portugal |
| <input type="checkbox"/> AU Australia | <input type="checkbox"/> IN India | <input type="checkbox"/> RO Romania |
| <input type="checkbox"/> AZ Azerbaijan | <input type="checkbox"/> IS Iceland | <input type="checkbox"/> RU Russian Federation |
| <input type="checkbox"/> BA Bosnia and Herzegovina | <input type="checkbox"/> JP Japan | |
| <input type="checkbox"/> BB Barbados | <input type="checkbox"/> KE Kenya | <input type="checkbox"/> SD Sudan |
| <input type="checkbox"/> BG Bulgaria | <input type="checkbox"/> KG Kyrgyzstan | <input type="checkbox"/> SE Sweden |
| <input type="checkbox"/> BR Brazil | <input type="checkbox"/> KP Democratic People's Republic of Korea | <input type="checkbox"/> SG Singapore |
| <input type="checkbox"/> BY Belarus | <input type="checkbox"/> KR Republic of Korea | <input type="checkbox"/> SI Slovenia |
| <input type="checkbox"/> BZ Belize | <input type="checkbox"/> KZ Kazakhstan | <input type="checkbox"/> SK Slovakia |
| <input type="checkbox"/> CA Canada | <input type="checkbox"/> LC Saint Lucia | <input type="checkbox"/> SL Sierra Leone |
| <input type="checkbox"/> CH & LI Switzerland and Liechtenstein | <input type="checkbox"/> LK Sri Lanka | <input type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> CN China | <input type="checkbox"/> LR Liberia | <input type="checkbox"/> TM Turkmenistan |
| <input type="checkbox"/> CO Colombia | <input type="checkbox"/> LS Lesotho | <input type="checkbox"/> TN Tunisia |
| <input type="checkbox"/> CR Costa Rica | <input type="checkbox"/> LT Lithuania | <input type="checkbox"/> TR Turkey |
| <input type="checkbox"/> CU Cuba | <input type="checkbox"/> LU Luxembourg | <input type="checkbox"/> TT Trinidad and Tobago |
| <input type="checkbox"/> CZ Czech Republic | <input type="checkbox"/> LV Latvia | |
| <input type="checkbox"/> DE Germany | <input type="checkbox"/> MA Morocco | <input type="checkbox"/> TZ United Republic of Tanzania |
| <input type="checkbox"/> DK Denmark | <input type="checkbox"/> MD Republic of Moldova | <input type="checkbox"/> UA Ukraine |
| <input type="checkbox"/> DM Dominica | <input type="checkbox"/> MG Madagascar | <input type="checkbox"/> UG Uganda |
| <input type="checkbox"/> DZ Algeria | <input type="checkbox"/> MK The former Yugoslav Republic of Macedonia | <input type="checkbox"/> US United States of America |
| <input type="checkbox"/> EC Ecuador | <input type="checkbox"/> MN Mongolia | <input type="checkbox"/> UZ Uzbekistan |
| <input type="checkbox"/> EE Estonia | <input type="checkbox"/> MW Malawi | <input type="checkbox"/> VN Viet Nam |
| <input type="checkbox"/> ES Spain | <input type="checkbox"/> MX Mexico | <input type="checkbox"/> YU Yugoslavia |
| <input type="checkbox"/> FI Finland | <input type="checkbox"/> MZ Mozambique | <input type="checkbox"/> ZA South Africa |
| <input type="checkbox"/> GB United Kingdom | <input type="checkbox"/> NO Norway | <input type="checkbox"/> ZM Zambia |
| <input type="checkbox"/> GD Grenada | | <input type="checkbox"/> ZW Zimbabwe |
| <input type="checkbox"/> GE Georgia | | |
| <input type="checkbox"/> GH Ghana | | |

Check-boxes below reserved for designating States which have become party to the PCT after issuance of this sheet:

- | | | |
|--------------------------------|--------------------------------|--------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM

The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application:* regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				
item (4)				
item (5)				

☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office) identified above as:

☐ all items ☐ item (1) ☐ item (2) ☐ item (3) ☐ item (4) ☐ item (5) ☐ other, see Supplemental Box

* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(h)(ii)): . . .

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):


Date (day/month/year) Number Country (or regional Office)

Box No. VIII DECLARATIONS

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

Number of
declarations

- | | | | |
|---|--|---|--|
| <input type="checkbox"/> Box No. VIII (i) | Declaration as to the identity of the inventor | : | |
| <input type="checkbox"/> Box No. VIII (ii) | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent | : | |
| <input type="checkbox"/> Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application | : | |
| <input type="checkbox"/> Box No. VIII (iv) | Declaration of inventorship (only for the purposes of the designation of the United States of America) | : | |
| <input type="checkbox"/> Box No. VIII (v) | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty | : | |

Box No. IX CHECK LIST; LANGUAGE OF FILING																																												
<p>This international application contains:</p> <p>(a) the following number of sheets in paper form:</p> <table style="width: 100%; border: none;"> <tr><td>request (including declaration sheets)</td><td style="text-align: right;">5</td></tr> <tr><td>description (excluding sequence listing part)</td><td style="text-align: right;">5</td></tr> <tr><td>claims</td><td style="text-align: right;">4</td></tr> <tr><td>abstract</td><td style="text-align: right;">1</td></tr> <tr><td>drawings</td><td style="text-align: right;">8</td></tr> <tr><td>Sub-total number of sheets</td><td style="text-align: right;">23</td></tr> <tr><td colspan="2">sequence listing part of description (actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (b) below)</td></tr> <tr><td>Total number of sheets</td><td style="text-align: right;">23</td></tr> </table> <p>(b) sequence listing part of description filed in computer readable form</p> <p>(i) <input type="checkbox"/> only (under Section 801(a)(i))</p> <p>(ii) <input type="checkbox"/> in addition to being filed in paper form (under Section 801(a)(ii))</p> <p>Type and number of carriers (diskette, CD-ROM, CD-R or other) on which the sequence listing part is contained (additional copies to be indicated under item 9(ii), in right column):</p>	request (including declaration sheets)	5	description (excluding sequence listing part)	5	claims	4	abstract	1	drawings	8	Sub-total number of sheets	23	sequence listing part of description (actual number of sheets if filed in paper form, whether or not also filed in computer readable form; see (b) below)		Total number of sheets	23	<p>This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):</p> <table style="width: 100%; border: none;"> <tr><td>1. <input checked="" type="checkbox"/> fee calculation sheet</td><td style="text-align: right;">1</td></tr> <tr><td>2. <input checked="" type="checkbox"/> original separate power of attorney</td><td style="text-align: right;">1</td></tr> <tr><td>3. <input type="checkbox"/> original general power of attorney</td><td></td></tr> <tr><td>4. <input type="checkbox"/> copy of general power of attorney; reference number, if any:</td><td></td></tr> <tr><td>5. <input type="checkbox"/> statement explaining lack of signature</td><td></td></tr> <tr><td>6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):</td><td></td></tr> <tr><td>7. <input type="checkbox"/> translation of international application into (language):</td><td></td></tr> <tr><td>8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material</td><td></td></tr> <tr><td>9. <input type="checkbox"/> sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other))</td><td></td></tr> <tr><td> (i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application)</td><td></td></tr> <tr><td> (ii) <input type="checkbox"/> (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter</td><td></td></tr> <tr><td> (iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column</td><td></td></tr> <tr><td>10. <input type="checkbox"/> other (specify):</td><td></td></tr> </table>	1. <input checked="" type="checkbox"/> fee calculation sheet	1	2. <input checked="" type="checkbox"/> original separate power of attorney	1	3. <input type="checkbox"/> original general power of attorney		4. <input type="checkbox"/> copy of general power of attorney; reference number, if any:		5. <input type="checkbox"/> statement explaining lack of signature		6. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):		7. <input type="checkbox"/> translation of international application into (language):		8. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material		9. <input type="checkbox"/> sequence listing in computer readable form (indicate also type and number of carriers (diskette, CD-ROM, CD-R or other))		(i) <input type="checkbox"/> copy submitted for the purposes of international search under Rule 13ter only (and not as part of the international application)		(ii) <input type="checkbox"/> (only where check-box (b)(i) or (b)(ii) is marked in left column) additional copies including, where applicable, the copy for the purposes of international search under Rule 13ter		(iii) <input type="checkbox"/> together with relevant statement as to the identity of the copy or copies with the sequence listing part mentioned in left column		10. <input type="checkbox"/> other (specify):		<p>Number of items</p>
request (including declaration sheets)	5																																											
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10. <input type="checkbox"/> other (specify):																																												
<p>Figure of the drawings which should accompany the abstract: Fig 3a</p>	<p>Language of filing of the international application: EN</p>																																											
<p>Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE</p> <p><i>Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).</i></p> <div style="text-align: center; margin-top: 20px;">  </div>																																												

For receiving Office use only	
<p>1. Date of actual receipt of the purported international application:</p> <p style="text-align: center; font-size: 1.2em;">20 JAN 2003 (20.01.03)</p>	<p>2. Drawings:</p> <p><input type="checkbox"/> received:</p> <p><input type="checkbox"/> not received:</p>
<p>3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:</p>	<p>6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid</p>
<p>4. Date of timely receipt of the required corrections under PCT Article 11(2):</p>	
<p>5. International Searching Authority (if two or more are competent): ISA /</p>	

For International Bureau use only
<p>Date of receipt of the record copy by the International Bureau:</p>

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET

Annex to the Request

For receiving Office use only

International Application No. **PCT/CN 03/00048**

Date stamp of the receiving Office **20 JAN 2003 (20.01.03)**

Applicant's or agent's
file reference **FPEL02150043**

Applicant

SAE MAGNETICS (H.K.) LTD.

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE **CNY500** **T**
2. SEARCH FEE **CNY1500** **S**

International search to be carried out by **CN**
(If two or more International Searching Authorities are competent to carry out the international search, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

Where item (b) of Box No. IX applies, enter Sub-total number of sheets } **23**
Where item (b) of Box No. IX does not apply, enter Total number of sheets }

b1 first 30 sheets **CHF650** **b1**

b2 x = **b2**
number of sheets fee per sheet
in excess of 30

b3 additional component (only if sequence listing part of description
is filed in computer readable form under Section 801(a)(i), or
both in that form and on paper, under Section 801(a)(ii)):

400 x = **b3**
fee per sheet

Add amounts entered at b1, b2 and b3 and enter total at B **CHF650** **B**

Designation Fees

The international application contains **1** designations.

1 x **CHF140** = **CHF140** **D**
number of designation fees amount of designation fee
payable (maximum 5)

Add amounts entered at B and D and enter total at I **CHF790** **I**

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) **P**

5. TOTAL FEES PAYABLE **CNY2000CHF790**
Add amounts entered at T, S, I and P, and enter total in the TOTAL box **TOTAL**

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☒ authorization to charge deposit account (see below) ☐ postal money order ☐ cash ☐ coupons
☐ cheque ☐ bank draft ☐ revenue stamps ☐ other (specify):

AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT

(This mode of payment may not be available at all receiving Offices)

☒ Authorization to charge the total fees indicated above.
☒ (This check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.
☒ Authorization to charge the fee for priority document.

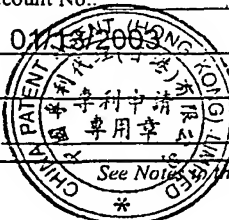
Receiving Office: RO/ **CN**

Deposit Account No.:

Date: **01/13/2003**

Name:

Signature:



SYSTEM AND METHOD FOR MANUFACTURE OF
A HARD DISK DRIVE ARM AND BONDING OF MAGNETIC HEAD
TO SUSPENSION ON A DRIVE ARM

5 Background Information

The present invention relates to magnetic hard disk drives. More specifically, the invention relates to a system for manufacturing a hard disk drive arm and the bonding of magnetic head to suspension on the drive arm.

Among the better known data storage devices are magnetic disk drives of the
10 type in which a magnetic head slider assembly floats on an air bearing at the surface of a rotating magnetic disk. Such disk drives are often called 'Winchester'-type drives. In these, one or more rigid magnetic disks are located within a sealed chamber together with one or more magnetic head slider assemblies. The magnetic disk drive may include one or more rigid magnetic
15 disks, and the slider assemblies may be positioned at one or both sides of the magnetic disks.

Figure 1 provides an illustration of a typical hard drive as used in the art. The slider assembly 108 may be mounted in a manner which permits gimbaled movement at the free outer end of the arm 102 such that an air bearing between
20 the slider assembly 108 and the surface of the magnetic disk 104 can be established and maintained. The drive arm 102 is coupled to an appropriate mechanism, such as a voice-coil motor (VCM) 106, for moving the arm 102 across the surface of the disk 104 so that a magnetic head contained within the slider assembly 108 can address specific concentric data tracks on the disk 104
25 for writing information onto or reading information from the data tracks.

Figure 2 provides an illustration of a hard drive arm and magnetic head as used in the art. Typically, the magnetic head (slider) 202 is electrically connected to the head gimbal assembly (HGA) by bonding means, such as gold ball bonding (GBB), solder bump bonding (SBB), and ultrasonic welding. Typically, four

connection points (balls) 204 are provided to electrically connect the magnetic head 202 to the suspension tongue/head gimbal assembly (HGA) 206. Two of the balls 204 are for the 'read' operation, and two of the balls 204 are for the 'write' operation. To prevent the bonding balls 204 from hardening with the magnetic head 202 in an undesirable orientation, a fixture 208 is used to strongly clamp the suspension tongue 206 and head 202 to be physically stable for ball 204 application by a soldering tool 210, etc. A base support 211 and a first clamping cover 220 stabilize the magnetic head 202. A second clamping cover 221 stabilizes the suspension tongue 206. A second base support (not shown) secures the load beam 212. This fixture 208 is utilized to prevent a change in orientation of the head 202 by the force of the soldering tool 210 during application. However, the clamping force of the fixture 208 is often enough to deform the magnetic head 202 and suspension tongue 212 structure causing improper orientation (alignment). Further, the forces involved have a tendency to damage the head 202 surface as well as the head suspension dimple 214.

It is therefore desirable to have a system to enable magnetic head electrical bonding while avoiding the aforementioned problems, in addition to providing other advantages.

In an aspect of the present invention, a system for manufacturing a data storage device comprising: a placement device to physically stabilize a hard drive head device for electrical bonding of said head device to a hard drive arm component, wherein said placement device utilizes sub-ambient pressure to maintain the position of said head device with respect to said arm component for said electrical bonding.

In a further aspect of the present invention, a method for manufacturing a data storage device comprising:

physically stabilizing, by a placement device, a hard drive head device for electrical bonding of said head device to a hard drive arm component and utilizing, by said placement device, sub-ambient pressure to maintain the

position of said head device with respect to said arm component for said electrical bonding.

Brief Description Of The Drawings

- 5 Figure 1 provides an illustration of a typical hard drive as used in the art.
Figure 2 provides an illustration of a hard drive arm and magnetic head as used in the art.
Figure 3 illustrates a hard drive arm suspension, magnetic head, and head placement device according to an embodiment of the present invention.
10 Figure 4 illustrates placement device design according to two different embodiments of the present invention.
Figure 5 illustrates placement device design according to three additional embodiments of the present invention.
Figure 6 illustrates placement device design according to three further
15 embodiments of the present invention.
Figure 7 illustrates placement device design for 'U'-shaped micro-actuator accommodation according to an embodiment of the present invention.
Figure 8 illustrates the design of a simultaneous operation placement device according to an embodiment of the present invention.

20

Detailed Description

- Figure 3 illustrates a hard drive arm suspension, magnetic head, and head placement device according to an embodiment of the present invention. As shown in figure 3a, in one embodiment, the placement device 305 has two vacuum
25 tubes 301, 304. The first vacuum pipe (tube) 301 has a fixture 311 that mates to the magnetic head 321 of a hard drive. As shown in figure 3b, in this embodiment, the first vacuum tube fixture 311 has a stepped 313 surface that mates with the head 321 in such a way that prevents rotational motion of the head 321 with respect to the placement device 305 (and thus, the suspension tongue 322). In one

embodiment, the step 313 is between 100 micrometers and 280 micrometers. In one embodiment, the second vacuum tube has a fixture mate-able to the load beam 324. Further, an alignment pin 303 is provided that is capable of being inserted into the tooling hole of the load beam 324 for ensuring proper alignment. In this embodiment, the placement device is secured to the magnetic head 321 and load beam 324 by sub-ambient pressure imposed by the first 301 and second 302 vacuum tubes, the first vacuum tube 301 applying suction force to the air bearing surface (ABS) of the slider/head 321 and the second vacuum tube 302 applying suction force to the load beam 324.

Figure 4 illustrates placement device design according to two different embodiments of the present invention. In one embodiment, shown in figure 4a and 4b, the fixture 402 of the first vacuum tube has an integrated step 403 to prevent rotational (yaw) 406 and longitudinal 408 motion of the magnetic head 404 during bonding ball 410 application. In another embodiment, shown in figure 4c and 4d, the fixture 412 of the first vacuum tube has an externally-mounted step structure 413. Further, figures 4b and 4d illustrate the air inlets of the first and second vacuum tubes.

Figure 5 illustrates placement device design according to three additional embodiments of the present invention. As shown in figure 5b, in one embodiment, an externally-mounted step structure 501 is provided with a side protrusion 502 to prevent transverse 503 motion (as well as longitudinal 504 and rotational 505 motion) of the magnetic head 508 (See figure 5a). As shown in figure 5c, in another embodiment, an externally-mounted step structure 511 is provided with two side protrusions 512 to prevent transverse 513 motion (as well as longitudinal 514 and rotational 515 motion) of the magnetic head 508 (See figure 5a). As shown in figure 5d, in yet another embodiment, an externally-mounted step structure 521 is provided with two side protrusions 522. Further, in this embodiment, a notch 524 is provided in the step 521 to allow for arm component clearance.

Figure 6 illustrates placement device design according to three further embodiments of the present invention. As shown in figure 6b, in one embodiment, the first vacuum tube 602 has an 'L'-shaped step structure 601 integrated in its mating surface to prevent transverse 603 motion (as well as longitudinal 604 and rotational 605 motion) of the magnetic head 608 (See figure 6a). As shown in figure 6c, in another embodiment, the first vacuum tube 612 has a 'U'-shaped step structure 611 integrated in its mating surface. As shown in figure 6d, in yet another embodiment, the first vacuum tube 622 has a 'U'-shaped step structure 621 integrated in its mating surface with a notch 623 provided to allow for arm component clearance.

Figure 7 illustrates placement device design for 'U'-shaped micro-actuator accommodation according to an embodiment of the present invention. As shown in figures 7b, 7c, and 7d, in one embodiment, a first vacuum tube 702 has an externally-mounted step 704 and two side-mounted steps 706 to restrict the motion of a magnetic head 708 that is mounted in a micro-actuator, such as a 'U'-shaped micro-actuator 710. This embodiment accommodates the shape of such a micro-actuator 710 while preventing the motion of the head 708 and micro-actuator 710 during the bonding process.

Figure 8 illustrates the design of a simultaneous operation placement device according to an embodiment of the present invention. In one embodiment, multiple individual placement devices 802 are combined into one machine 804 in order to stabilize components of many hard drive load arms for simultaneous head bonding operations.

Although several embodiments are specifically illustrated and described herein, it will be appreciated that modifications and variations of the present invention are covered by the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention.

What is claimed is

1. A system for manufacturing a data storage device comprising:
a placement device to physically stabilize a hard drive head device for electrical
5 bonding of said head device to a hard drive arm component, wherein
said placement device utilizes sub-ambient pressure to maintain the position of
said head device with respect to said arm component for said electrical bonding.
2. The system of claim 1, wherein said hard drive head device is a hard disk drive
10 magnetic head.
3. The system of claim 2, wherein said hard drive arm component is a suspension
tongue.
- 15 4. The system of claim 1, wherein said electrical bonding is ball bonding.
5. The system of claim 4, wherein said electrical bonding is a type selected from
the group consisting of gold ball bonding (GBB), solder bump bonding (SBB),
ultrasonic welding, and stitch bonding.
- 20 6. The system of claim 1, wherein said placement device includes a first vacuum
tube structure for providing said sub-ambient pressure to affix said first vacuum
tube structure to said head device.
- 25 7. The system of claim 6, further comprising an alignment pin protruding from
said placement device.
8. The system of claim 7, wherein said alignment pin is capable of being inserted
into a suspension tooling hole for ensuring said proper alignment.

9. The system of claim 7, further comprising a second vacuum tube structure for providing sub-ambient pressure, wherein said first vacuum tube structure vacuum-couples to said head device and said second vacuum tube structure
5 vacuum-couples to a suspension load beam attached to said arm component.

10. The system of claim 9, wherein the first vacuum tube structure includes a step structure mate-able to an edge of the head device.

10 11. The system of claim 10, wherein said step structure is mate-able to one or more edges of said head device.

12. The system of claim 11, wherein said step structure is an integral structure of the first vacuum tube.

15

13. The system of claim 11, wherein said step structure is an external structure.

14. The system of claim 9, wherein said first vacuum tube structure is a material selected from the group consisting of Stainless Steel, Copper, Aluminum Oxide,
20 Polyimide, and Ceramic.

15. The system of claim 9, wherein said second vacuum tube structure is a material selected from the group consisting of Stainless Steel, Copper, Aluminum Oxide, Polyimide, and Ceramic.

25

16. A method for manufacturing a data storage device comprising:
physically stabilizing, by a placement device, a hard drive head device for electrical bonding of said head device to a hard drive arm component and
utilizing, by said placement device, sub-ambient pressure to maintain the

position of said head device with respect to said arm component for said electrical bonding.

17. The method of claim 16, wherein said hard drive head device is a hard disk
5 drive magnetic head.

18. The method of claim 17, wherein said hard drive arm component is a suspension tongue.

10 19. The method of claim 16, wherein said electrical bonding is ball bonding.

20. The method of claim 19, wherein said electrical bonding is a type selected from the group consisting of gold ball bonding (GBB), solder bump bonding (SBB), ultrasonic welding, and stitch bonding.

15

21. The method of claim 16, wherein said placement device includes a first vacuum tube structure for providing said sub-ambient pressure to affix said first vacuum tube structure to said head device.

20 22. The method of claim 21, further comprising:
providing an alignment pin protruding from said placement device.

23. The method of claim 22, wherein said alignment pin is capable of being inserted into a suspension tooling hole for ensuring said proper alignment.

25

24. The method of claim 22, further comprising:
providing sub-ambient pressure, by a second vacuum tube;
vacuum-coupling said first vacuum tube structure to said head device; and
vacuum-coupling said second vacuum tube structure to a suspension load beam

attached to said arm component.

25. The method of claim 24, wherein the first vacuum tube structure includes a step structure mate-able to an edge of the head device.

5

26. The method of claim 25, wherein said step structure is mate-able to at least the leading edge of said head device.

27. The method of claim 24, wherein said first vacuum tube structure is a material
10 selected from the group consisting of Stainless Steel, Copper, Aluminum Oxide, Polyimide, and Ceramic.

28. The method of claim 24, wherein said second vacuum tube structure is a
material selected from the group consisting of Stainless Steel, Copper,
15 Aluminum Oxide, Polyimide, and Ceramic.

Abstract

A system and method are disclosed for the manufacture of a hard disk drive arm and the bonding of magnetic head to suspension on the drive arm.

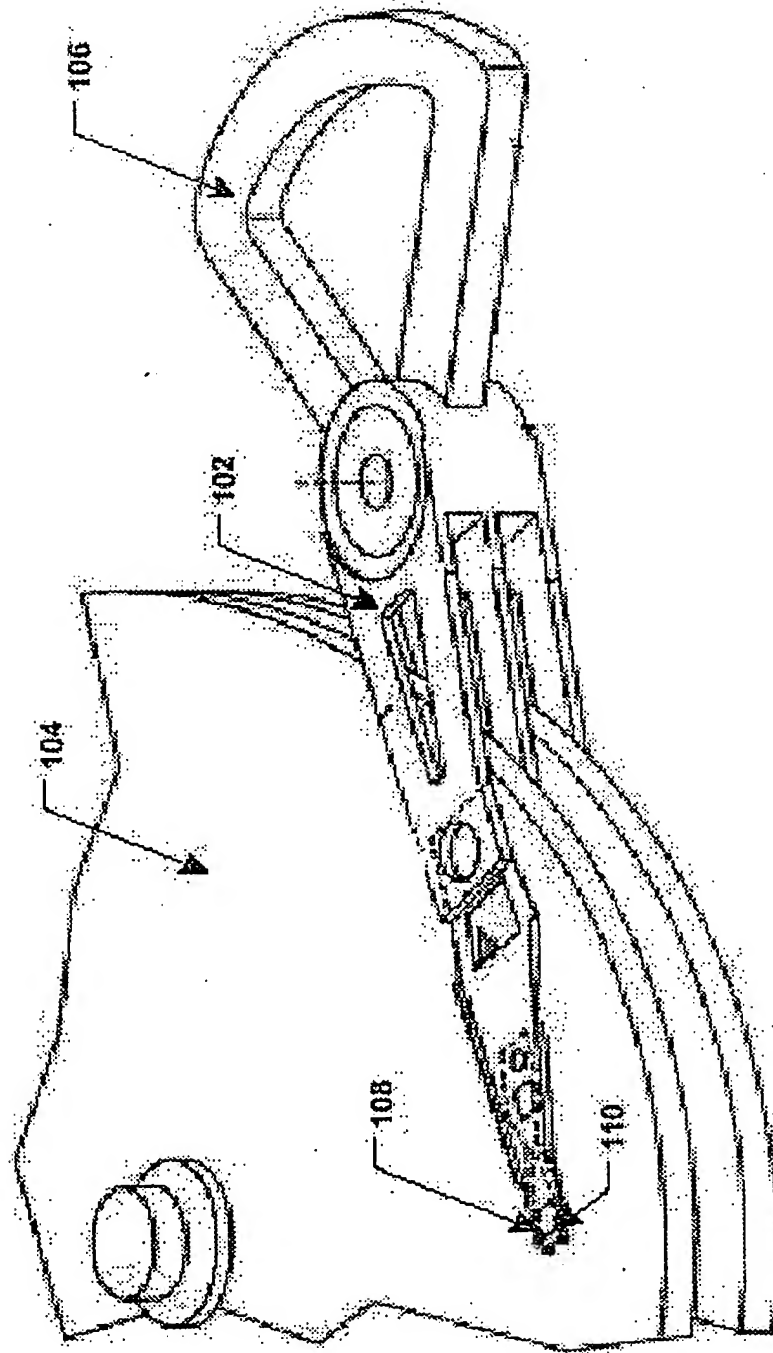


FIG. 1
(Prior Art)

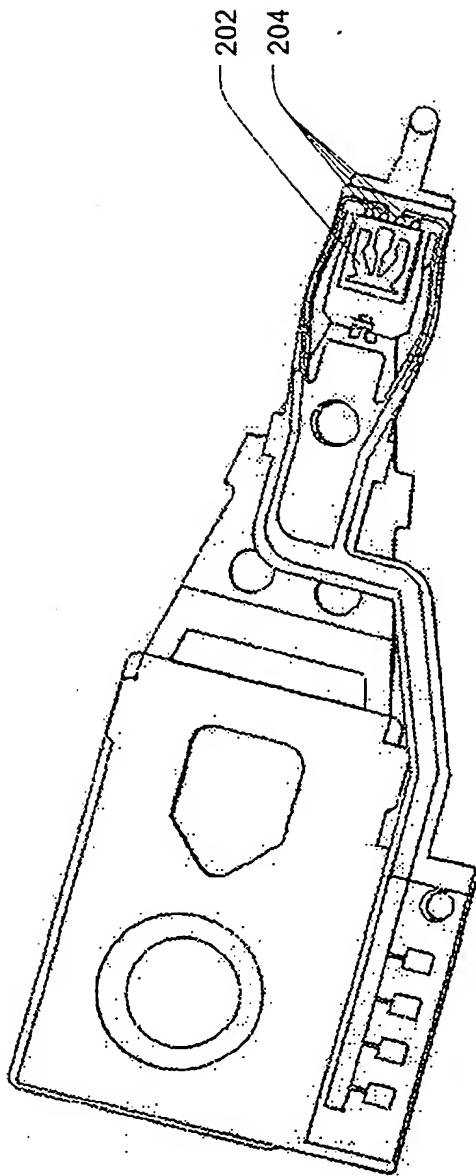


FIG. 2a

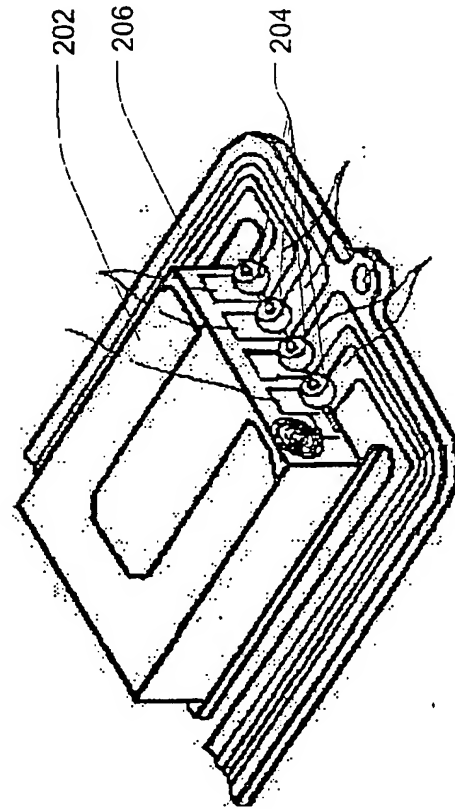


FIG. 2b

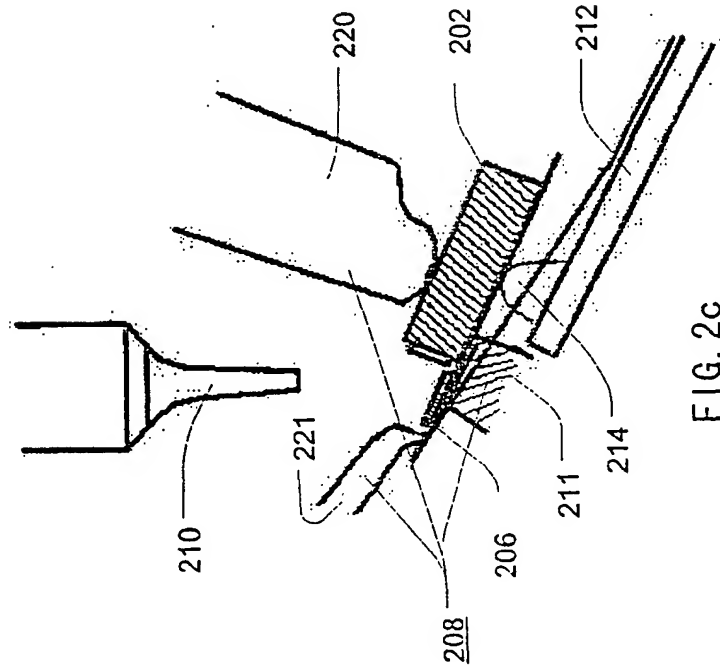


FIG. 2c

FIG. 2
(Prior Art)

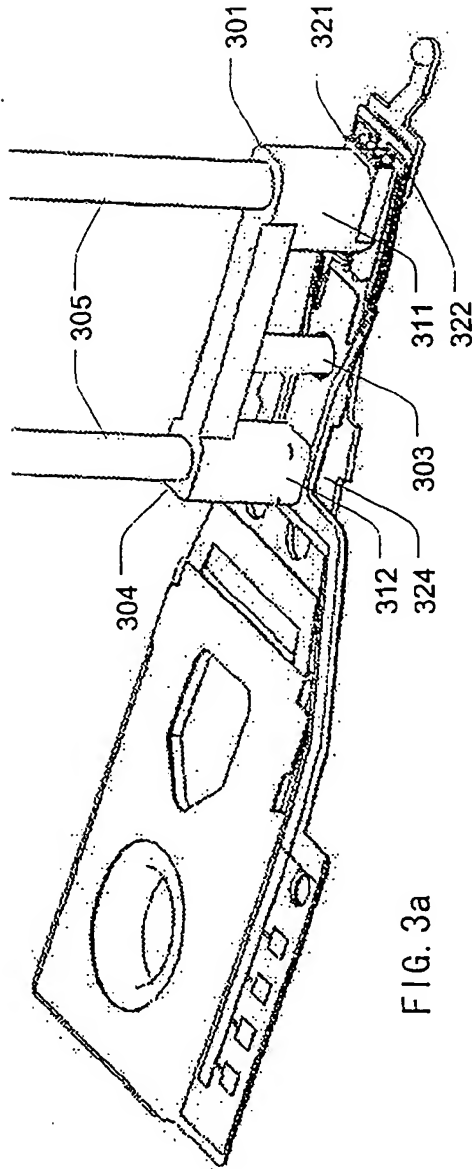


FIG. 3a

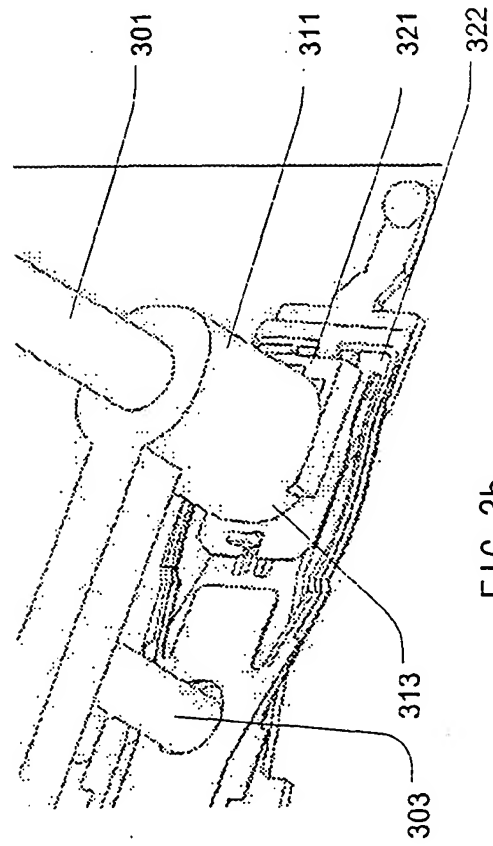


FIG. 3b

FIG. 3

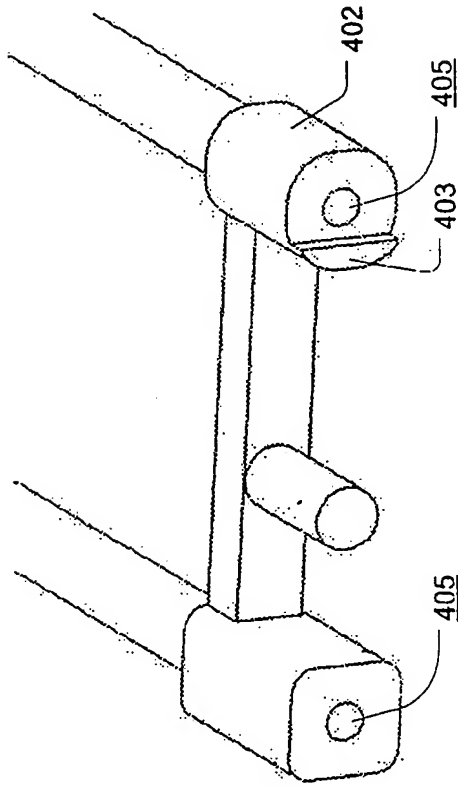


FIG. 4b

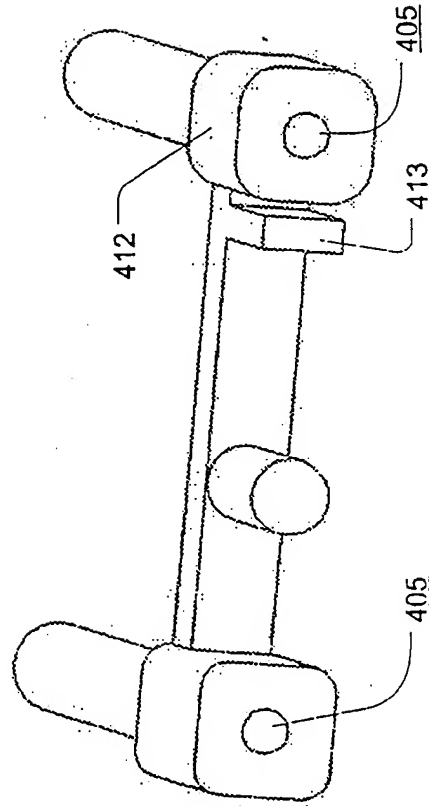


FIG. 4d

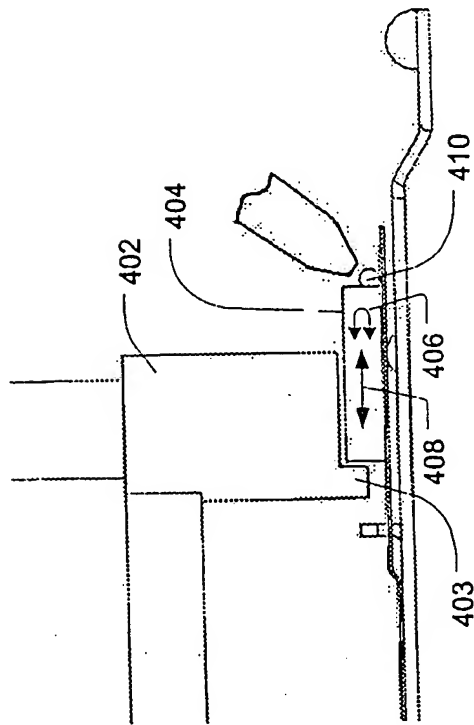


FIG. 4a

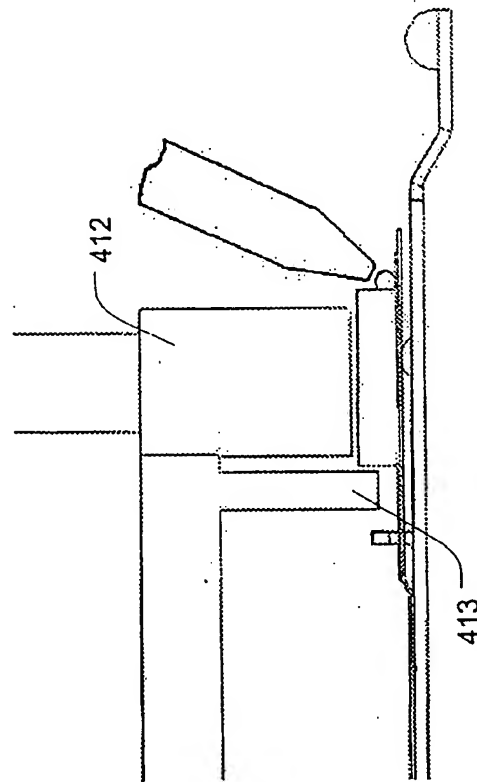


FIG. 4c

FIG. 4

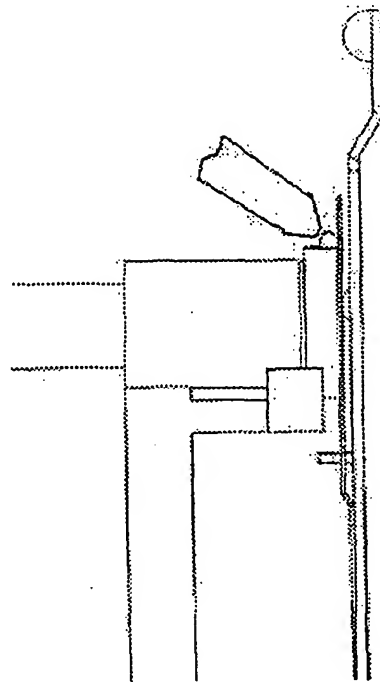


FIG. 5a

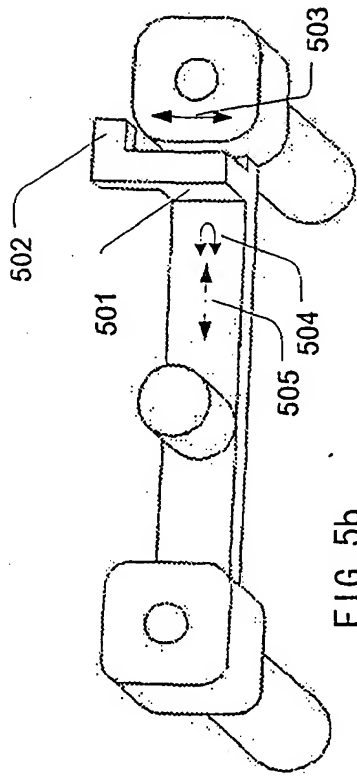


FIG. 5b

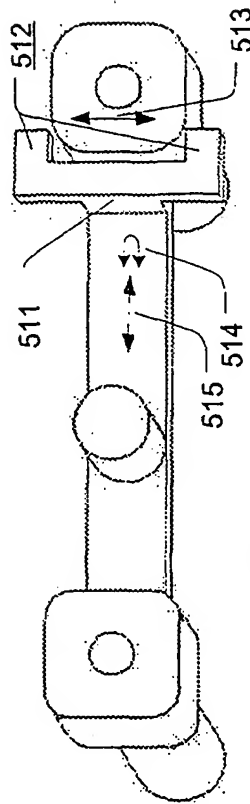


FIG. 5c

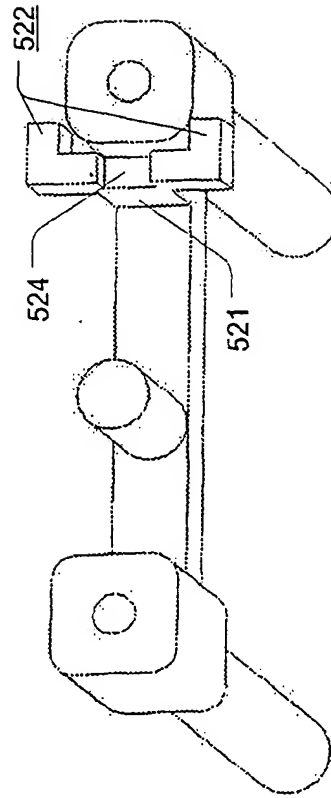


FIG. 5d

FIG. 5

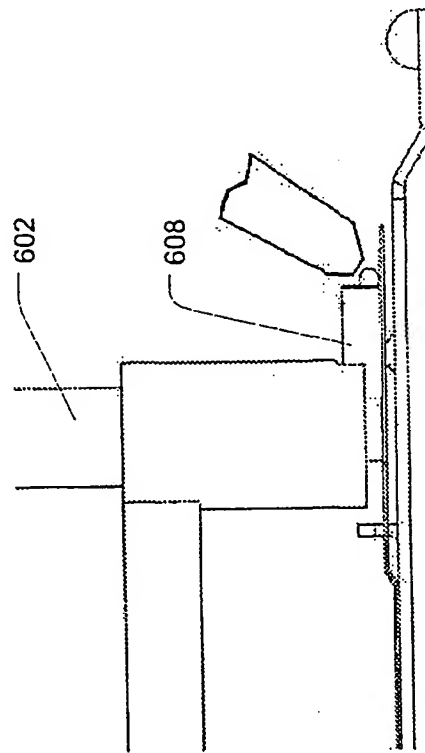
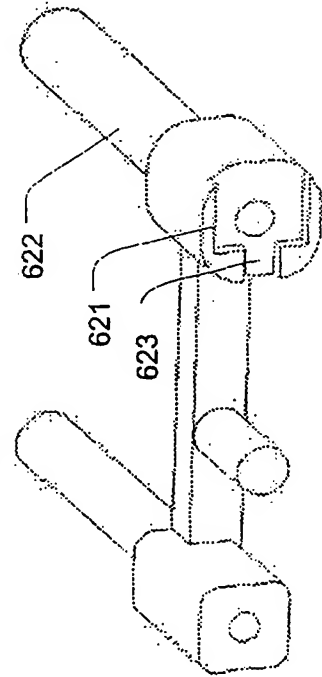
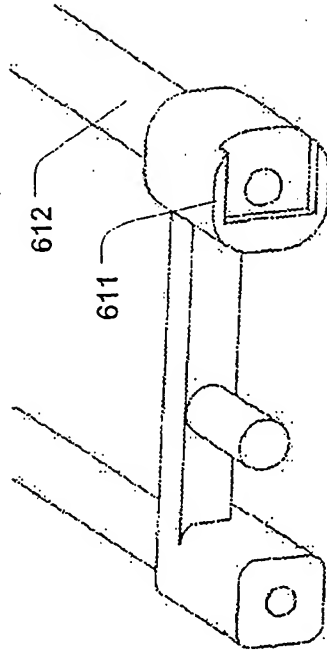
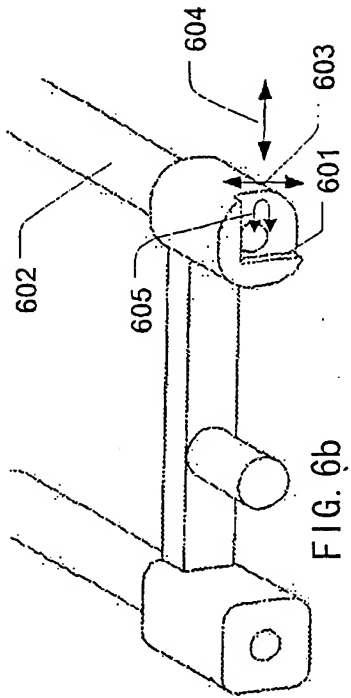


FIG. 6

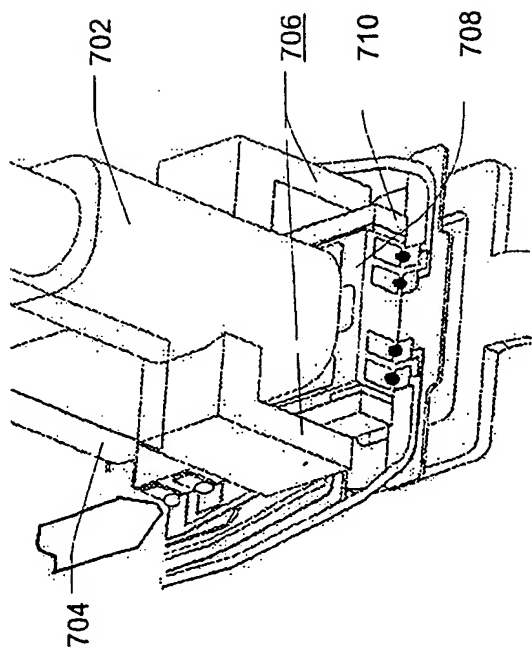


FIG. 7b

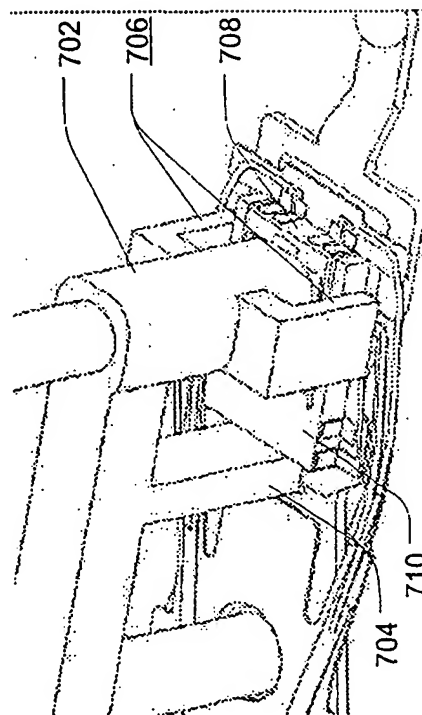


FIG. 7c

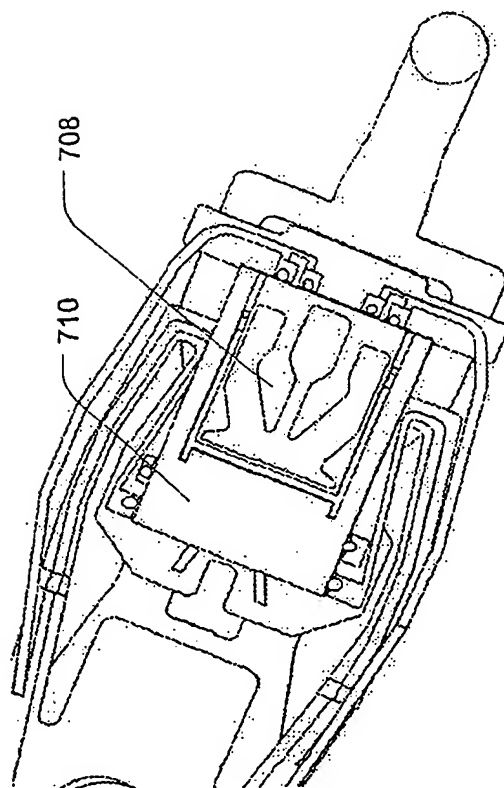


FIG. 7a

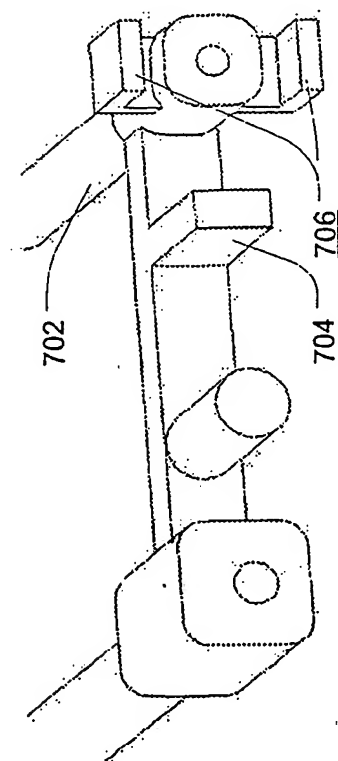


FIG. 7d

FIG. 7

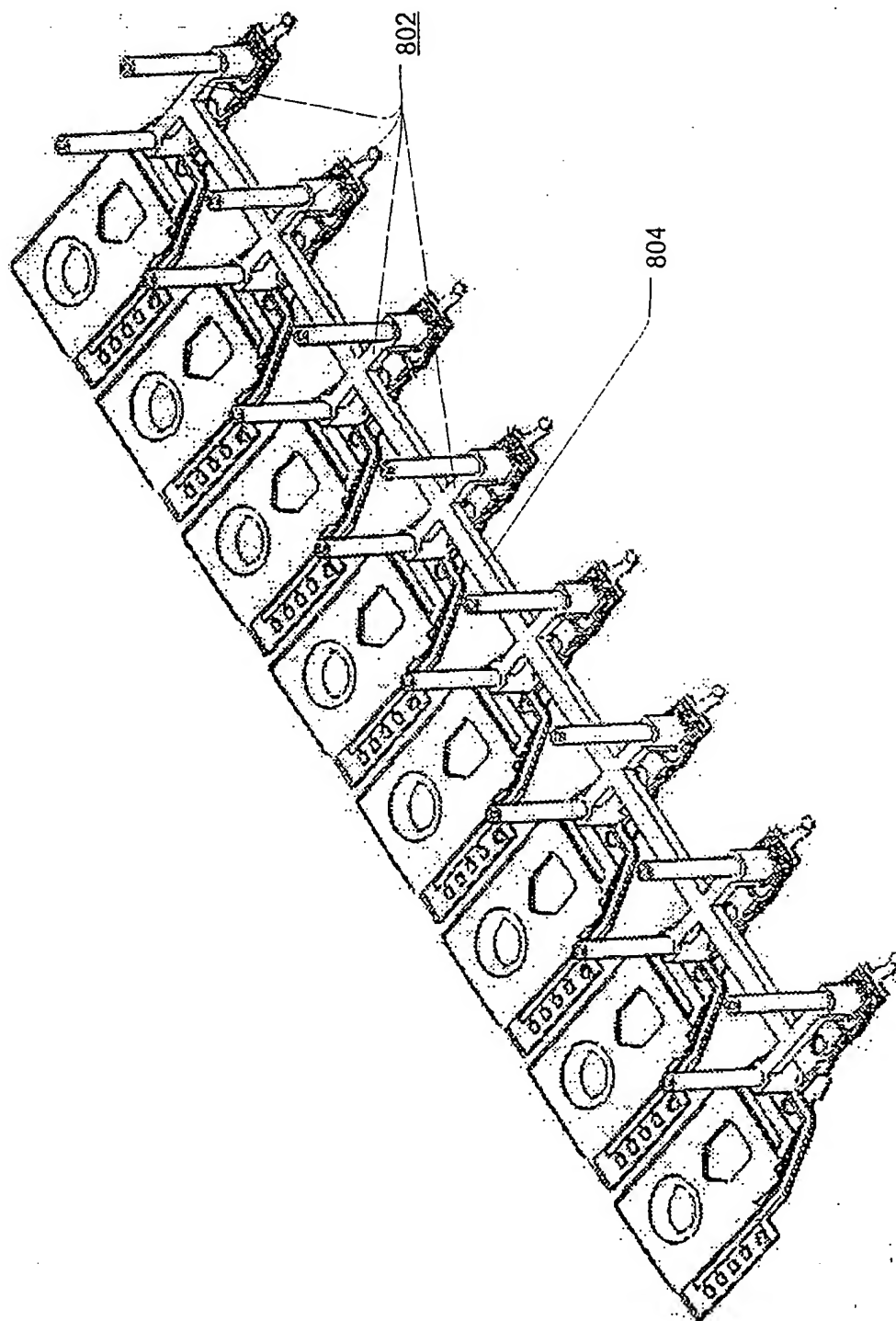


FIG. 8